United Industries, Inc.

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ASTM A269 vs A270

A number of differences exist between ASTM specifications A269 and A270. ASTM A269 covers ***Seamless and Welded Austenitic Stainless Steel Tubing for General Service***. The focus of A269 is mechanical integrity and corrosion resistance of stainless tubing for a variety of applications. It is incorporated in the list of acceptable material specifications in the *ASME B31.3 Process Piping Code*.

ASTM A270 covers ***Seamless and Welded Austenitic Stainless Steel Sanitary Tubing***". This specification's emphasis is on the surface finish of tubing, which can be specified in a number of ways to a number of different finishes. Surface finish integrity and cleanability are the main focus of this specification as surface irregularities can trap contaminants. This requires special operator attention and slower line speeds than A269 product.

A270 is incorporated in the list of acceptable material specifications in the *3A Sanitary Standards* and in the ***ASME BPE Bioprocessing Equipment Standard***. Tubes manufactured and certified to the BPE Standard are 100% bore-scoped for ID surface defects.

- ✓ A270 raw material and finished product is inspected to surface finish requirements, whereas A269 is not. A269 requires only a workmanlike finish, and minor surface imperfections are acceptable for A269 service. Often these imperfections are too deep for removal by mechanical polishing. United's basic A270 ID mechanically polished finish is a true 20 μ-in Ra maximum (ANSI B46.1), normally averaging 12-18 μ-in Ra. Bright annealed (not polished) A270 ID surfaces normally measure less than 25 μ-in Ra (average of 4 readings at weld root, 90°, 180°, and 270°). Surface roughness for A269 tubing is normally not measured or controlled.

- ✓ Special packaging procedures are used by our metal suppliers to protect A270 surface integrity, but are not necessary for A269 applications.

- ✓ A269 does not address weld slag and other process related inclusions, and is less stringent than A270 with respect to surface condition. The more stringent surface finish requirements of A270 result in lower overall yields in tubing production.

- ✓ A270/S2 has special supplemental requirements specific to the pharmaceutical industry, A269 does not.
  - Sulfur content for 316 and 316L grades must be in the range of 0.005 – 0.017 wt %.
  - Specific surface defect acceptance criteria are spelled out in the BPE Standard.
  - All tubing is to be end capped, plastic sleeved and boxed.
  - United's A270 pharma tubing is certified as cleaned for oxygen (CFOS) service per ASTM G93-03 and CGA G-4.1

- ✓ A269 permits pickled or bright annealed surface conditions.
  A270 permits Mill Finish, Mechanically Polished to a variety of grit finishes, or Electropolished ID with Mechanically Polished OD

- ✓ Dimensional control requirements are the similar, though not identical, for the two specifications, working from a nominal OD dimension. Tolerances for various sizes are shown in Table 2. Note that A270 has two different wall thickness tolerances depending on the service application, with pharmaceutical requirements being a bit tighter.

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Table 1. Comparison of Requirements #		
	ASTM A269	ASTM A270
Used for	General Service Pipeline Applications Corrosive, Cryogenic or Elevated Temperature service Adopted in ASME Process Piping Code	Food / Dairy Pharmaceutical Semi-Conductor Not currently in ASME Process Piping Code
Service Qualities	Structural integrity Corrosion resistance	Structural integrity Corrosion resistance Surface finish Cleanability / sanitizability / sterility
Special Mfg Requirements	Seamless or Welded Hot or Cold Finished Supplied in Mill Finish Condition	Seamless or Welded or Heavily Cold Worked Hot or Cold Finished Usually mechanically polished or electro-polished on ID and / or OD
Required Heat Treat	Solution Anneal 1900°F minimum (or as required by alloy)	Solution Anneal 1900°F minimum (or as required by alloy)
OD Tolerances	Centered about nominal OD value	Centered about nominal OD value
Wall Thickness Tolerances	+ / - 10%	A270 (dairy): + / - 12.5% A270/S2 (pharma): + / - 10%
Alloys	304, 316, 317, 321, 347, 348, 904L 6% Molybdenum grades,	304, 316, 6% Molybdenum & Duplex grades Special chemical restrictions for Pharma Quality
Required Tests Chemical composition Line Marking Outer Dimensions Wall Thickness	 X X X X	 X (Sulfur range restriction for 316 & 316L for Pharma) X X X
Hardness Tensile Strength Grain Size	X	X (S2 Pharma quality only) X (S2 Pharma quality only) -
Flare Flange Flattening Reverse Flatten Reverse Bend Reverse Bend Flatten	X (seamless only) X (welded only) X	- X (S2 Pharma quality only) X (S2 Pharma quality only) X
Eddy Current / UT Hydrostatic Pressure Air Under Water Straightness	X* X* X (S2 on demand) X	X* X* X
Corrosion Special Heat Treat (Stress relief, stabilize) Surface Finish Special Packaging	X (S4 on demand) X (S3 on demand	X (S1 on demand) X X (S2 Pharma quality only)
X* Either hydrostatic pressure test or non-destructive electric test required. Manufacturer has option of selecting test method unless specified by purchaser.		

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Table 2. Dimension Tolerances #

A269 Permissible Variations				A270 Permissible Variations				A270 Pharma & ASME BPE Permissible Variations		
OD Size in (mm)	OD in (mm)	Wall Thickness %	Length in (mm)	OD Size in (mm)	OD in (mm)	Wall Thickness %	Length in (mm)	OD in (mm)	Wall Thickness %	Length in (mm)
< 0.50 (13)	±0.005 (0.13)	±15	1/8 (3.2)	≤ 1.000 (25)	±0.005 (0.13)	±12.5	1/8 (3)	±0.005 (0.13)	±10	-0 / +2 (-0 / +50)
0.5 < D < 1.5 (13 < D < 38)	±0.005 (0.13)	±10	1/8 (3.2)	1 < D < 2 (25 < D < 50)	±0.008 (0.20)	±12.5	1/8 (3)	±0.008 (0.20)	±10	-0 / +2 (-0 / +50)
1.5 < D < 3.5 (38 < D < 89)	±0.010 (0.25)	±10	1/8 (3.2)	2 < D < 3 (50 < D < 75)	±0.010 (0.25)	±12.5	1/8 (3)	±0.010 (0.25)	±10	-0 / +2 (-0 / +50)
3.5 < D < 5.5 (89 < D < 140)	±0.015 (0.38)	±10	3/16 (4.8)	3 < D < 4 (75 < D < 100)	±0.015 (0.38)	±12.5	3/16 (5)	±0.015 (0.38)	±10	-0 / +2 (-0 / +50)
5.5 < D < 8 (140 < D < 203)	±0.030 (0.76)	±10	3/16 (4.8)	4< D < 5.5 (100< D <140)	±0.015 (0.38)	±12.5	3/16 (5)	±0.015 (0.38)	±10	-0 / +2 (-0 / +50)
8 < D < 12 (203 < D < 305)	±0.040 (1.01)	±10	3/16 (4.8)	5.5 < D < 8 (140 < D < 200)	±0.030 (0.75)	±12.5	3/16 (5)	±0.030 (0.75)	±10	-0 / +2 (-0 / +50)
12 < D < 14 (305 < D < 356)	±0.050 (1.26)	±10	3/16 (4.8)	8 – 12 (200 – 300)	±0.050 (1.25)	±12.5	3/16 (5)	±0.050 (1.25)	±10	-0 / +2 (-0 / +50)

Requirements as per ASTM A269/A269M -15a (2019) and A270/270M – 15 (2019)